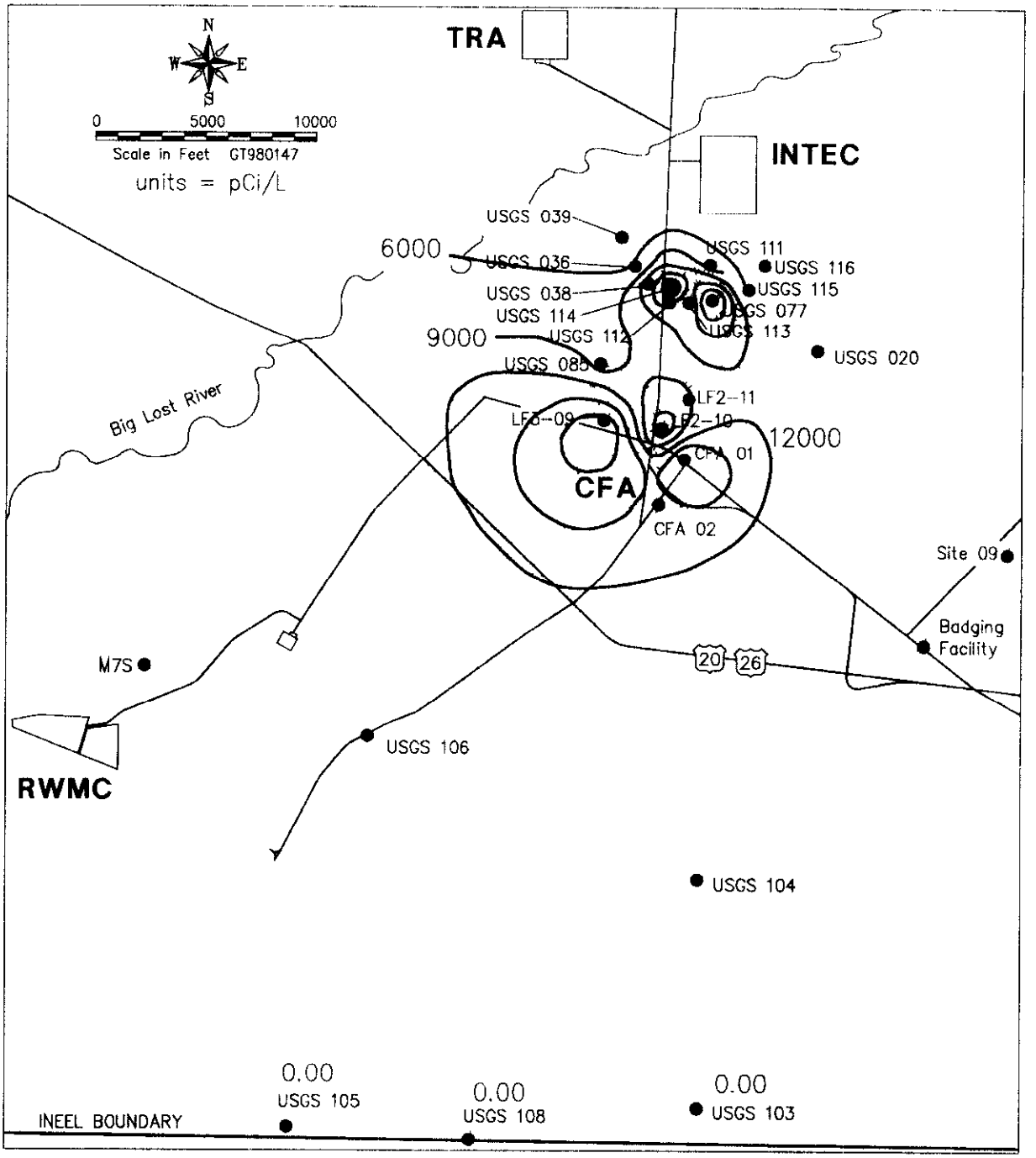

Figure 4-37. Tritium concentrations in the SRPA near CFA. (concentrations in pCi/L)

Five wells out of the 41 in the vicinity of CFA have been sampled for uranium-234. All of five wells including USGS 36, 39, 112, 114, and 116 have detected uranium-234 above the detection limit. These wells were sampled only once in October 1994 with the exception of well USGS 112 which was sampled again in May 1995, and resulted in an additional positive detection. The MCL has never been exceeded in these wells however, the risk based concentration was exceeded in all samples collected from USGS 39 and 112. There are no wells sampled for uranium-234 at CFA.

Due to the fact that little groundwater data has been collected for uranium-234 in either the INTEC or CFA areas, it is difficult to determine the source area(s). However, groundwater model predictions from the WAG 3 RI/FS (Schafer et al., 1996) indicate that total uranium, originating from INTEC, will significantly affect groundwater concentrations at CFA. These model simulations indicate that groundwater concentrations at CFA will exceed 0.14 pCi/L from approximately 1994 through the end of their simulations which ended in 2939. Concentrations exceeding 1.4 pCi/L would occur at CFA between 1994 and 2095. Concentrations exceeding the 10^{-6} risk levels were predicted to occur at CFA between 1994 and 2025 and continuing through the end of the simulation period at 2939.

Schafer et al., (1996) state that total uranium to the aquifer from the vadose zone peaks in 2435, with only 1% of the mass leaving the vadose zone by 2095, and only 53.5% by 2939 when the simulation was stopped. Throughout the total simulation time in the aquifer, there are two local maxima in the peak concentration at INTEC which are both below the MCL and above the 10^{-6} risk levels. These occur early in 1986 and later in 2475. Data used for model simulations included various uranium isotopes in the soils inventory (82.24%) and were discharged to the injection well (14.24%) and percolation ponds (3.11%), as well as being a part of the CPP-31 (0.39%) and CPP-28 (0.02%) releases. A single simulation for the total uranium was performed. Resultant concentrations and risk were calculated assuming that the total uranium mass distribution is 6×10^{-3}% uranium-234, 0.6% uranium-235, 1.5×10^{-2}% uranium-236, and 99.38% uranium-238. These distributions correspond with the activity distribution of 51.2% uranium-234, 1.8% uranium-235, 1.3% uranium-236, and 45.7% uranium-238.

Due to the lack of groundwater field data it is impossible to determine all sources for all uranium isotopes. It is possible that CFA is contributing to uranium groundwater concentrations based on detections of uranium in the vadose zone. However, these concentrations, originating from CFA would most likely be minimal compared to those originating from upgradient sources.

4.3.1.2.19 Uranium-235. The MCL for uranium-235 is 14.5 pCi/L. The background concentration has not been established in the SRPA. The 10^{-6} risk based concentration is 1.01 pCi/L.

Six wells out of the 41 wells in the vicinity of CFA have been sampled for uranium-235. All of these wells are located between INTEC and CFA, except for M7S which is located near the RWMC. Most of the wells have been sampled only once and no well has uranium-235 above the detection limit.

Uranium-235 has been detected in the vadose zone (soil samples) at CFA and therefore may be contributing this contaminant to the SRPA. However, without analytical data it is impossible to determine if there is a source or where that source(s) is located. However, modeling efforts by Schafer et al., (1996) indicate that uranium, originating from INTEC, will significantly influence groundwater concentrations at CFA in the near future. For additional information on these model predictions see Section 4.3.1.2.18.

4.3.1.2.20 Uranium-238. The MCL for uranium-238 is 14.6 pCi/L. The background concentration has not been established in the SRPA. The 10^{-6} risk-based concentration is 0.768 pCi/L.

Five wells in the vicinity of CFA have been monitored for uranium-238. All of these wells are located between INTEC and CFA including USGS 36, 112, 114, and 116, except well M7S which is located near the RWMC. Most of the wells have been sampled only once and all have uranium-238 above the detection limit. The single samples from these wells were collected in October 1994 and an additional sample was collected from USGS 112 in 1995 uranium-238 was not detected. Samples from these wells did not exceed the MCL, however the sample collected from USGS 112 (0.9 pCi/L) in October 1994 did exceed the risk based concentration. No groundwater wells at CFA are monitored for uranium-238.

Uranium-238 has been detected in the vadose zone (soil samples) at CFA and therefore may be contributing this contaminant to the SRPA. However, without monitor well data it is impossible to determine if there is a source or where that source(s) is located. The limited upgradient groundwater data along with model simulations by Schafer et al., (1996), indicate a source at INTEC. These modeling efforts suggest that uranium, originating from INTEC, will significantly influence groundwater concentrations at CFA in the near future. For additional information on these model predictions see Section 4.3.1.2.18.

4.3.1.2.21 Zinc. The background concentration is 14.5 ug/L in the SRPA. The risk-based concentration for zinc is 10,000 ug/L (HI=1 risk).

Thirty wells in the vicinity of CFA have been sampled for zinc. All of these wells except USGS 36 have zinc above the detection limit. Twelve of the 30 wells are located at CFA and are regularly monitored for zinc. Most of the remaining 18 wells are located upgradient of CFA and are not regularly monitored for zinc. Most of these wells, located between INTEC and CFA, have been sampled for zinc once or twice.

One well, LF-3-11, has had a single sample with a concentration greater than the MCL and the HI=1 risk level. This sample was collected in August 1993 and contained 35,500 ug/L of zinc. However, a single sample collected in June 1993 contained only 375 ug/L and a sample during October 1993 contained 1,050 ug/L. Therefore, based on the other concentrations the 35,500 ug/L concentration to be considered suspect.

High concentrations of zinc may be the result of galvanized pipe in the monitoring wells. Zinc from the galvanized pipe is added to the groundwater, discharging through the pump, by "electro-plating." This is evident in the USGS wells located between INTEC and CFA. These wells are relatively close together and should provide similar zinc concentrations. However, those wells which contain stainless steel material below the water table including; USGS 20, 34, 35, 37, 38, 39, and 85, have significantly lower zinc concentrations than wells with galvanized material below the water table. Those wells in proximity to the above listed wells which have galvanized material include; USGS 111, 112, 113, 114, 115, and 116. The average zinc concentration from those wells which have all stainless steel material below the water table is 54 ug/L. The average concentration for wells having galvanized material below the water table is 223 ug/L. These averages included all samples from the above stated wells. The same comparison, between galvanized versus stainless steel material, could not be performed for wells at CFA due to the lack of well completion information.

Regardless of the above stated reasons for the suspect levels of zinc at CFA , the concentrations appear to be overall higher than those from upgradient wells. This is illustrated in Figure 4-38, which is the most current zinc groundwater concentrations from the wells in the vicinity of CFA. This figure is compiled using 1995 through 1997 data. The USGS wells, predominately located between INTEC and CFA, were last sampled in 1995 and the wells near CFA were sampled in 1997. The wells at CFA were not sampled for zinc until 1996.

There are no known discharges of zinc to the soil or groundwater. Detections of zinc are due to galvanized components in monitoring wells.

4.3.2 Conclusion

Analysis of groundwater data from CFA wells indicated that five of the 26 COCs identified for CFA have never been sampled for in the groundwater and less than half of the remaining 21 have had adequate monitoring in order to determine a source(s) location. Several COCs were sampled once or several times in the past with all samples indicating a positive detection and have not been sampled since. In general, the well spacing at CFA and between CFA and INTEC is adequate, however the inconsistent monitoring of COCs makes it difficult if not impossible to identify specific source(s) of contamination at CFA. Groundwater data for each COC is summarized in Table 4-4. Groundwater modeling results that were developed to support the baseline risk assessment are discussed in Section 6.3.3.3.

Groundwater data collected from groundwater monitoring in the vicinity of CFA, INTEC, TRA, and RWMC were evaluated. Several conclusions can be made related to the potential contaminants and the groundwater monitoring wells in the vicinity of CFA, as a result of this evaluation.

The 25 COCs evaluated are summarized in Table 4-4 and include VOC, inorganic, and radiological chemicals that have been detected in groundwater monitoring wells. The presence of these contaminants in the groundwater are primarily attributable to INTEC and TRA, facilities upgradient from CFA.

The groundwater monitoring wells from which data was collected was also evaluated and resulted in the following general conclusions related to the groundwater monitoring wells.

1. The groundwater-monitoring network for CFA as a facility is inadequate, primarily due to lack of downgradient wells. The three existing downgradient wells (CFA-MON-01, -02, and –03) are likely too far downgradient of the source (approximately 1 mile) to determine the source of contaminants if detected.

2. The monitoring network around CFA Landfills 1 and 3 is adequate. The existing monitoring program and the placement of wells at the CFA Landfills is designed to detect potential contaminants associated with the landfills. However, concerns over whether an additional downgradient well is still needed for Landfill 1 were expressed during the scoping of OU 4-13. The monitoring network around Landfill 2 is adequate.

3. In general, the number of upgradient wells and their placement is adequate, however inconsistent monitoring of COCs makes identification of contaminant sources difficult. Samples for the COCs identified have not been collected from 5 of the 26 wells in the vicinity of CFA. Also, monitoring of the remaining 21 wells in inadequate to determine the source(s) of contaminants in the groundwater.

4. GWSCREEN modeling of potential contaminants at CFA release sites and former tank sites indicates that potential petroleum releases will not pose unacceptable risk to groundwater receptors. It is not possible to verify the model outputs because of the lack of groundwater data collected from downgradient.

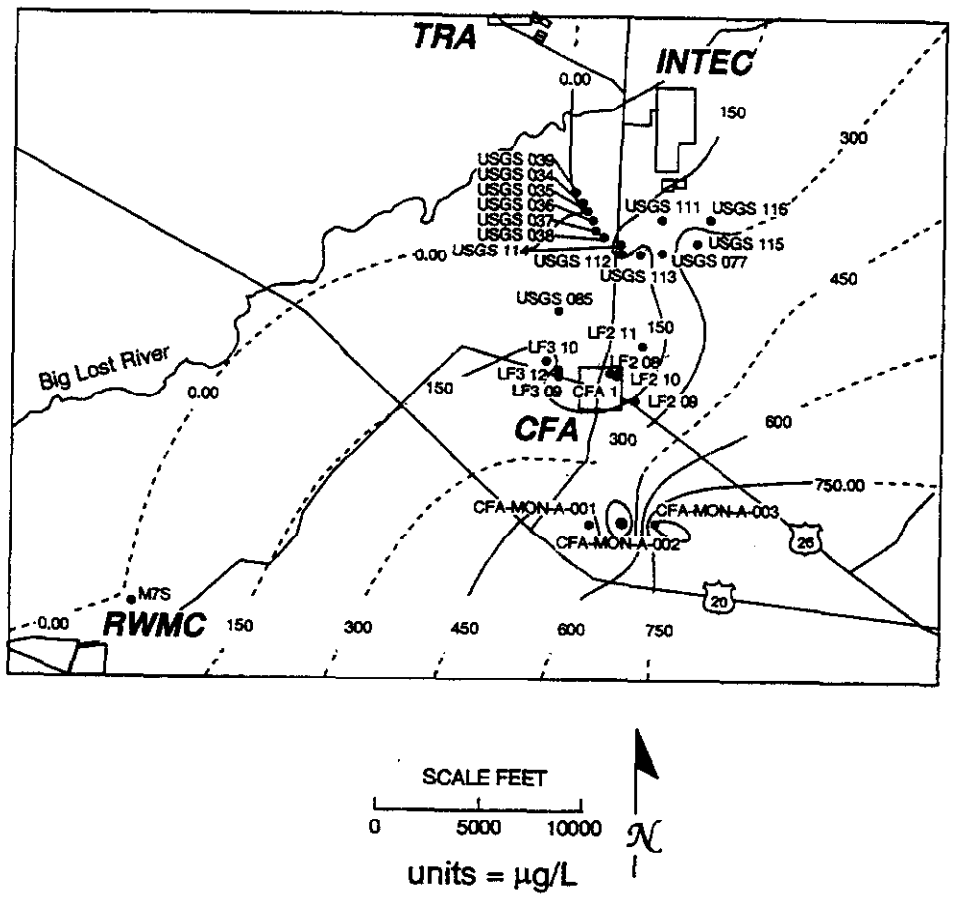

Figure 4-38. 1995–1997 zinc concentrations in the SRPA near CFA. (Concentrations in ug/L.)

Table 4-4. Summary of groundwater contaminants of concern.

Contaminants of Concern	Monitoring Practice	Result of Monitoring	Possible Sources CFA	Possible Sources INTEC/TRA	Comments
1-2, Dichloroethane	Inconsistent	Limited samples suggest the COC is not present at either facility	Unknown	Unknown	
Americium-241	No samples from CFA wells. Inconsistent monitoring in wells between INTEC and CFA.	Predominately non-detects, however, some positive detects in wells between INTEC and CFA.	Unknown	Yes	Model predictions indicate Am-241 originating at INTEC should not significantly effect groundwater concentrations at CFA.
Arsenic	Good	CFA wells indicate increasing concentrations since 1996. Widely distributed throughout the regional area.	Unknown – the latest concentrations are higher at CFA than in upgradient wells. However, this could be due to INTEC plume movement downgradient to CFA area.	Yes	Model predictions indicate arsenic from INTEC will significantly affect concentrations at CFA.
Beryllium	Inconsistent	Not consistently detected above background levels	Unknown	Unknown	
Cadmium	Good at CFA wells. Inconsistent in upgradient wells.	Widely distributed in both soil and groundwater throughout regional area.	Probable – Concentrations at CFA are higher than in upgradient wells	Unknown	It is unlikely that a cadmium source exists at CFA due to widespread distribution I the soil and groundwater regionally.
Chloromethane	Good at CFA wells. Moderate to poor in upgradient wells.	Does not appear to be present in the area near CFA.	No	Probably not, unless it is a recent release.	
Chromium	Good	Widely distributed in wells near INTEC and CFA.	Unknown – high concentrations from upgradient sources	Yes	

Table 4-4. (continued).

Contaminants of Concern	Monitoring Practice	Result of Monitoring	Possible Sources CFA	Possible Sources INTEC/TRA	Comments
			overshadow any contributions from a local source.		
Cesium-137	Inconsistent at CFA. Recent monitoring in upgradient wells is good.	Not present in any of the monitored wells near CFA or INTEC.	Unknown – limited data suggests it is not present.	No	Only one well sampled near CFA since 1995.
Iodine-129	Poor	Concentrations from 1986 to 1995 indicate high concentrations originating near INTEC and through time this plume has moved downgradient to CFA.	Unknown – upgradient concentrations are overshadowing any local contributions to the aquifer.	Yes	
Mercury	Good at CFA. Inconsistent in upgradient wells.	Inconsistent detections at levels slightly higher than background in most CFA and INTEC wells.	Possible – overall, concentrations in CFA wells are higher than in upgradient wells.	Unknown, the few positive concentrations are slightly above background levels.	No consistent positive concentrations from wells near CFA and INTEC.
Phenol	Not monitored in wells near CFA. One round of samples from upgradient wells.	One round (6 wells) of samples from upgradient wells did not have a positive detect.	Unknown	Unknown	
Plutonium-238	Poor at CFA wells. Inconsistent at upgradient wells.	Sparse data suggests it is not a significant problem in the aquifer at CFA or upgradient near INTEC.	Unknown	Unknown	
Plutonium-239	No wells are sampled at CFA nor at INTEC.		Unknown	Unknown	

Table 4-4. (continued).

Contaminants of Concern	Monitoring Practice	Result of Monitoring	Possible Sources CFA	Possible Sources INTEC/TRA	Comments
Plutonium-239/240	No wells at CFA are monitored. Inconsistent monitoring in upgradient wells.	Sparse sampling data from upgradient wells suggests it not present.	Unknown	Unknown	Model predictions suggest INTEC sources will significantly affect CFA in the future.
Strontium-90	Inconsistent at CFA wells. Good in upgradient wells.	Few positive detections at CFA. Upgradient wells have higher concentrations.	Unknown – Due to inconsistent monitoring and/or overshadowing of upgradient concentrations.	Yes	Models suggest that concentrations at CFA will not be significantly affected from upgradient sources until approximately 2025.
Tritium	Good	Higher concentrations in upgradient wells.	Unknown – high concentrations from upgradient sources would most likely overshadow all local sources.	Yes	
Trichloroethene	Good in CFA wells. Inconsistent in upgradient wells.	Overall, higher concentrations from CFA wells.	Yes	Probable – Several positive detections at the detection level.	
Uranium-234 and 238	Poor	Five wells (1 samples each) had positive detection	Unknown	Probable – all samples have positive detections	
Uranium-235	Poor	Five wells (1 sample each, all nondetects)	Unknown	Unknown – limited samples did not detect U-235.	
Zinc	Good	Widely distributed in the CFA-INTEC area	Yes	Yes	Detections of zinc are due to galvanized components on the monitoring wells.
Aroclor-1254	No Data				

Table 4-4. (continued).

Contaminants of Concern	Monitoring Practice	Result of Monitoring	Possible Sources CFA	Possible Sources INTEC/TRA	Comments
Aroclor-1260	No Data				
Benzaldehyde	No Data				
TPH-gasoline	No Data				
TPH-diesel	No Data				

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5. REVISIONS TO THE OU 4-13 REMEDIAL INVESTIGATION FEASIBILITY STUDY WORK PLAN OU 4-13 FIELD SAMPLING

This section discusses documented revisions to the field sampling plan and the RI/FS Work Plan (McCormick et al. 1997). These revisions were documented, reviewed, and approved using LMITCO Document Action Requests (DARs).

5.1 CFA-04 Revisions to the Field Sampling Plan

Several areas were identified during the field investigation at the CFA-04 site that required additional samples to be collected and/or a modification of the existing sampling design. Changes were made per the DARs discussed below.

Additional samples were collected in the CFA-04 Pond (ER-DAR-681). Low areas in the pond bottom were identified as a result of the topographic survey where liquids containing mercury and other contaminants may have concentrated. Additional sample locations were biased to these areas of the pond. The samples were collected to determine the maximum concentrations of potential contaminants in the surface sediments of the pond. They were analyzed for mercury, zirconium, and arsenic.

Samples were collected (ER-DAR-681) in the staging area immediately north of the pond. Mercury retort soil treatment equipment was located in the staging area during the time-critical removal action in 1995. Surface samples were collected in a random distribution to determine the maximum concentrations of mercury, zirconium, and arsenic.

Samples were collected (ER-DAR-681) from tanks used during the mercury retort process. The tanks contained water from decontamination operations. The analyses were used to determine the waste disposal options for the tanks and contents.

The conditions for collection of samples for gamma screen analyses were revised (ER-DAR-684). Prior to approval of this DAR, samples for gamma screen analysis were collected and analyzed to ensure compliance with shipping regulations. This change, implemented as a cost saving measure, allowed the radiation control technician to use site process knowledge to eliminate the gamma screen prior to shipping.

Additional samples were collected from the trenches in the Western Anomaly near the CFA-04 Pond (ER-DAR-790). These samples replaced the original samples collected per the OU 4-13 Field Sampling Plan, because the holding times for these samples were not attained by the laboratory.

The depth of sediments in the pond was measured (ER-DAR-795). These measurements will be used in the feasibility study to determine the amount of soil in the pond bottom.

Additional samples were collected from the pond bottom and windblown areas in July 1998. These data are used in the risk assessment and to determine the waste status of the soil for the FS.

5.2 CFA-08 Revisions to the Field Sampling Plan

Twenty subsurface samples were added to the CFA-08 drainfield sampling design (ER-DAR-681). Samples were collected to a depth of 2.1 m (7 ft.) along the three pipelines between the CFA-657 Pumphouse and the drainfield. These samples were collected to determine if contaminated soil was

present in the vicinity of the drainfield delivery pipelines, from leakage. Samples were collected in the vicinity of the pipelines and analyzed for Sr-90, which was used as an indicator contaminant. If Sr-90 was detected in a subsurface soil sample additional samples were analyzed for other potential contaminants.

Further evaluation of the pipelines was proposed using a camera system (ER-DAR-790). The pipes were excavated at a location approximately half way between the CFA-657 Pumphouse and the drainfield and holes were drilled into each pipe. Water and sludge was present in the pipes, consequently, the camera system could not be used and additional samples were collected (ER-DAR-847). Samples were collected from the water and sludge in the pipelines and analyzed to determine their toxicity characteristics. These analyses will be used to determine the type of wastes, their disposition, and cost associated with the waste disposition.

A performance evaluation sample was collected and analyzed at the laboratory (ER-DAR-681). This evaluation is designed to test the performance of the radiological laboratory analysis by submitting a sample with known activity levels.

The conditions for collection of samples for gamma screen analysis were revised (ER-DAR-684). Prior to approval of this DAR samples for the gamma screen analysis were collected and analyzed for shipping purposes. This change, implemented as a cost saving measure, allows for a radiation control technician to use site process knowledge and radiological screening to eliminate the gamma screen prior to shipping.

5.3 CFA-10 Revisions to the Field Sampling Plan

Data were collected during the July 1998 sampling activity to determine the concentration of lead at a depth of 0.6 m (2 ft) and to determine the waste status of the soil.

5.4 Risk Assessment Deviations from the OU 4-13 RI/FS Work Plan

5.4.1 Contaminant Screening

An initial contaminant screen was conducted in Section 3.4 of the OU 4-13 RI/FS Work Plan for each of the retained sites to identify contaminants of potential concern (COPCs). As discussed in the Work Plan, the identified COPCs were to be retained for evaluation in this RI/BRA.

A deviation from this approach is that a supplemental contaminant screen was also conducted for each of the chemicals identified initially as COPCs in the Work Plan. The supplemental contaminant screen (Section 4) was conducted to refine the results of the initial contaminant screen presented in the OU 4-13 RI/FS Work Plan (i.e., refine the list of COPCs to be retained for risk evaluation in the BRA). The supplemental contaminant screen was necessary for the following reasons:

- Removal actions were performed at some of the retained sites (i.e., CFA-06, CFA-13, CFA-15, CFA-17, CFA-42, CFA-47). Additional analytical data was therefore available for these sites following confirmatory soil sampling (i.e., post-removal verification data).

- Additional site characterization of CFA-04 and CFA-08 during the 1997 field season was performed after the initial contaminant screen had been conducted. Additional analytical data were therefore available for these sites.

- More recent risk-based screening concentrations have been issued since the Work Plan was written. All site and COPCs retained based on the OU 4-13 RI/FS Work Plan were re-screened using the more recent risk-based screening concentrations.

A result of conducting the supplemental contaminant screen is that some of the chemicals identified as COPCs in the Work Plan were eliminated, from risk evaluation in the BRA. These chemicals are summarized in Table 5-1.

In addition, several sites for which COPCs were identified in the Work Plan were eliminated from further evaluation (i.e., CFA-06, CFA-43, CFA-44, CFA-49, CFA-51). These sites were not retained for further evaluation because the supplemental contaminant screen eliminated all COPCs.

5.4.2 Radionuclide Screening Concentrations

The risk-based screening concentrations used to screen radionuclides in the supplemental contaminant screen differ from the risk-based radionuclide screening concentrations used in the RI/FS Work Plan. Risk-based radionuclide screening concentrations used in the supplemental contaminant screen were based on residential 100-year values presented in Table 5 of "Radionuclide Risk-Based Concentration Tables" (Fromm 1996).

Table 5-1. COPCs identified in the Work Plan that were eliminated in the supplemental contaminant screen and not evaluated in the BRA.

Site	COPC Not Evaluated
CFA-04	Aroclor-1254, Carbazole, Lead
CFA-06	Arsenic, Lead
CFA-07	Arsenic, Co-60
CFA-08	Aroclor-1254, Arolcor-1260, Arsenic, Carbazole, Isophorone, Am-241, Co-60, Eu-152, Eu-154
CFA-10	Aroclor-1254, Aroclor-1260, Arsenic
CFA-12	Co-60, Cs-134, Eu-154, Zn-65
CFA-17	Aroclor-1260, Arsenic, Benzo(b)fluoranthene, Lead
CFA-42	2-Methylnaphthalene
CFA-43	Lead
CFA-44	Lead
CFA-46	TPH-g
CFA-47	Benzo(b)fluoranthene, Chrysene
CFA-49 (Evaluated as CFA-08 STP)	Co-60
CFA-51	Lead

5.5 Revisions to the WAG 4 Miscellaneous Sites 1997 Non-Time Critical Removal Action. The DARs discussed incorporated changes to the FSP (DOE 1997).

Revisions to the FSP were made during the removal action which are documented with DARs. Changes to the FSP were necessary due to the varying conditions encountered at the removal action sites. The presence of structures such as buildings, tanks, and drywells required a flexible approach to field sampling. The changes to the FSP included the addition of sample locations and analyses intended to ensure that contaminants were located and removed as necessary. The addition of screening samples resulted in less standby or down- time for workers and equipment at the sites.

ER-DAR-770

Six soil samples and associated QA/QC samples were added to the plan for collection at CFA-17 and CFA-47. These samples were collected to meet the requirements in the Risk Based Corrective Action guidance document (Idaho 1997). Samples were analyzed to determine physical properties, including dry bulk density, porosity, moisture content, total organic content, and hydraulic conductivity.

ER-DAR-922 (9/12/97) and –948 (9/25/97)

Sample locations were added to the FSP to collect screening samples from the subsurface soils in the vicinity of former building CFA-640. The number and location of samples was determined by the field team leader based on the presence of visible contamination or the type of structures found. Samples were analyzed for PAHs, VOCs, and metals.

ER-DAR-904 (8/20/97)

Ten screening locations (maximum) were added to the FSP to collect samples from locations at CFA-42. The number and location of samples was determined by the field team leader based on the presence of contamination found during demolition of structures at the site. Samples were analyzed for PAHs and VOCs.

ER-DAR-855, -971, and -976

Additional samples were added to the plan to collect screening samples at CFA-13, -15, -17, -42, and –47. Screening samples were collected to direct excavation of contaminated soils. The number and location of samples were determined by the field team leader based on the presence of potential contamination found at the sites. Samples were analyzed for PAHs, metals, and VOCs.

5.6 References

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